Best Practice Questions on Java Array

Problem 1: Maximum Sum of Non-Adjacent Elements

Description:

Given an array of integers, find the maximum sum of non-adjacent elements. You may not pick two adjacent elements.

Input Format:

1. An integer n representing the number of elements in the array.
2. An array of n integers.

Output Format:

1. Output a single integer representing the maximum sum.

Test Cases:

1. Test Case 1:

   Input:
   5
   3 2 5 10 7

   Output:
   15

2. Test Case 2:

   Input:
   4
   1 2 3 4

Output:
6

3. Test Case 3:

   Input:
   6
   5 1 1 5 10 6

   Output:
   15

4. Test Case 4:

   Input:
   7
   3 2 7 10 12 15 20

   Output:
   32

5. Test Case 5:

   Input:
   3
   10 5 6

   Output:
   16

6. Test Case 6:

Input:
8
3 2 7 10 12 15 20 25

Output:
50

7. Test Case 7:

Input:
4
8 1 3 9

Output:
17

8. Test Case 8:

Input:
5
1 2 3 4 5

Output:
9

9. Test Case 9:

Input:
6

6 7 1 30 8 2

Output:
37

10. Test Case 10:

Input:
5
20 10 30 50 10

Output:
80

Problem 2: Rotate Array

Description:

Given an array and a number k, rotate the array to the right by k steps.

Input Format:

1. An integer n representing the number of elements in the array.
2. An array of n integers.
3. An integer k representing the number of steps to rotate.

Output Format:

1. Output the rotated array.

Test Cases:

1. Test Case 1:

   Input:
   5
   1 2 3 4 5
   2

   Output:
   4 5 1 2 3

2. Test Case 2:

   Input:
   4
   7 8 9 10
   3

   Output:
   8 9 10 7

3. Test Case 3:

   Input:
   6
   1 2 3 4 5 6
   4

   Output:
   3 4 5 6 1 2

4. Test Case 4:

   Input:
   7
   10 20 30 40 50 60 70
   5

   Output:
   50 60 70 10 20 30 40

5. Test Case 5:

   Input:
   3
   15 25 35
   1

   Output:
   25 35 15

6. Test Case 6:

   Input:
   5
   2 4 6 8 10
   0

   Output:
   2 4 6 8 10

7. Test Case 7:

   Input:
   8
   5 10 15 20 25 30 35 40
   3

   Output:
   20 25 30 35 40 5 10 15

8. Test Case 8:

   Input:
   4
   1 2 3 4
   2

   Output:
   3 4 1 2

9. Test Case 9:

   Input:
   6
   9 7 5 3 1 0
   4

   Output:
   3 1 0 9 7 5

10. Test Case 10:

Input:
5
2 3 4 5 6
7

Output:
5 6 2 3 4

Problem 3: Find Peak Element

Description:

A peak element is an element that is greater than its neighbors. Given an array of integers, find a peak element.

Input Format:

1. An integer n representing the number of elements in the array.
2. An array of n integers.

Output Format:

1. Output a peak element. If there are multiple, output any one of them.

Test Cases:

1. Test Case 1:

Input:
5
1 3 20 4 1

Output:
20

2. Test Case 2:

Input:
6
10 20 15 2 23 90

Output:
20

3. Test Case 3:

Input:
4
1 2 3 4

Output:
4

4. Test Case 4:

Input:
7

5 10 20 15 7 6 1

Output:
20

5. Test Case 5:

Input:
3
1 2 3

Output:
3

6. Test Case 6:

Input:
8
1 3 20 4 1 0 5 6

Output:
20

7. Test Case 7:

Input:
5
5 10 10 2 1

Output:

10

8. Test Case 8:

Input:
6
1 2 3 1 5 6

Output:
3

9. Test Case 9:

Input:
7
1 2 3 4 5 4 3

Output:
5

10. Test Case 10:

Input:
5
1 3 5 4 2

Output:
5

Problem 4: Longest Subarray with Sum Zero

Description:

Given an array of integers, find the length of the longest subarray with a sum of zero.

Input Format:

1. An integer n representing the number of elements in the array.
2. An array of n integers.

Output Format:

1. Output the length of the longest subarray with a sum of zero.

Test Cases:

1. Test Case 1:

   Input:
   5
   15 -2 2 -8 1

   Output:
   4

2. Test Case 2:

   Input:
   6

1 2 -3 3 4 -2

Output:
5

3. Test Case 3:

Input:
4
1 -1 1 -1

Output:
4

4. Test Case 4:

Input:
7
3 -2 -1 1 2 -1 1

Output:
6

5. Test Case 5:

Input:
8
1 2 3 -3 -2 -1 2 1

Output:

4

6. Test Case 6:

Input:
5
1 2 -2 1 -2

Output:
2

7. Test Case 7:

Input:
6
-3 2 3 1 -4 5

Output:
4

8. Test Case 8:

Input:
7
4 -2 -1 2 -1 2 -1

Output:
6

9. Test Case 9:

Input:
4
0 -1 1 0

Output:
4

10. Test Case 10:

Input:
5
5 -5 5 -5 5

Output:
2

Problem 5: Maximum Product Subarray

Description:

Given an integer array, find the contiguous subarray within an array (containing at least one number) which has the largest product.

Input Format:

1. An integer n representing the number of elements in the array.
2. An array of n integers.

Output Format:

1. Output the maximum product of the contiguous subarray.

Test Cases:

1. Test Case 1:

   Input:
   5
   2 3 -2 4 -1

   Output:
   6

2. Test Case 2:

   Input:
   4
   -2 0 -1 0

   Output:
   0

3. Test Case 3:

   Input:
   6
   -1 -2 -9 4 -6 0

   Output:
   72

4. Test Case 4:

   Input:
   7
   3 -1 4 -2 5 -3 6

   Output:
   360

5. Test Case 5:

   Input:
   5
   1 -2 -3 4 -5

   Output:
   120

6. Test Case 6:

   Input:
   6
   2 3 -2 4 -1 1

   Output:
   48

7. Test Case 7:

Input:
8
-2 -3 0 -2 -40 0 -2 -3

Output:
80

8. Test Case 8:

Input:
5
1 2 3 4 5

Output:
120

9. Test Case 9:

Input:
3
-1 -2 -3

Output:
6

10. Test Case 10:

yaml

Input:
7

-1 -2 3 -4 5 -6 7

Output:
2520

Problem 6: Find the Missing Number

Description:

Given an array containing n distinct numbers taken from 0, 1, 2, ..., n, find the one that is missing from the array.

Input Format:

1. An integer n representing the number of elements in the array.
2. An array of n integers.

Output Format:

1. Output the missing number.

Test Cases:

1. Test Case 1:

Input:
5
0 1 2 3 5

Output:
4

2. Test Case 2:

   Input:
   3
   1 0 3

   Output:
   2

3. Test Case 3:

   Input:
   4
   0 1 3 4

   Output:
   2

4. Test Case 4:

   Input:
   7
   0 1 2 3 4 5 7

   Output:
   6

5. Test Case 5:

Input:
6
0 1 2 4 5 6

Output:
3

6. Test Case 6:

Input:
2
1 0

Output:
-1

7. Test Case 7:

Input:
8
0 1 2 3 4 5 7 8

Output:
6

8. Test Case 8:

Input:
4

2 3 0 1

Output:
-1

9. Test Case 9:

Input:
5
4 2 1 0 3

Output:
-1

10. Test Case 10:

Input:
6
5 3 2 4 1 0

Output:
-1

Problem 7: Find the Majority Element

Description:

Given an array of size n, find the majority element. The majority element is the element that appears more than n/2 times in the array.

Input Format:

1. An integer n representing the number of elements in the array.
2. An array of n integers.

Output Format:

1. Output the majority element. If there is no majority element, output -1.

Test Cases:

1. Test Case 1:

   Input:
   7
   3 3 4 2 4 4 2

   Output:
   4

2. Test Case 2:

   Input:
   5
   1 2 3 4 5

   Output:
   -1

3. Test Case 3:

Input:
6
1 1 1 2 2 1

Output:
1

4. Test Case 4:

Input:
4
2 2 1 1

Output:
-1

5. Test Case 5:

Input:
8
7 7 7 7 6 6 7 7

Output:
7

6. Test Case 6:

Input:
3

1 1 2

Output:
1

7. Test Case 7:

Input:
10
2 2 2 2 2 3 3 3 1 1

Output:
2

8. Test Case 8:

Input:
9
1 1 1 1 2 2 2 2 2

Output:
2

9. Test Case 9:

Input:
6
2 2 1 1 1 2

Output:

-1

10. Test Case 10:

Input:
5
4 4 4 4 5

Output:
4

Problem 8: Longest Increasing Subsequence

Description:

Given an integer array, find the length of the longest increasing subsequence.

Input Format:

1. An integer n representing the number of elements in the array.
2. An array of n integers.

Output Format:

1. Output the length of the longest increasing subsequence.

Test Cases:

1. Test Case 1:

Input:
6
10 9 2 5 3 7

Output:
3

2. Test Case 2:

Input:
4
3 2 5 6

Output:
3

3. Test Case 3:

Input:
5
1 2 3 4 5

Output:
5

4. Test Case 4:

Input:
7
10 9 8 7 6 5 4

Output:
1

5. Test Case 5:

Input:
8
1 2 4 3 5 4 7 6

Output:
5

6. Test Case 6:

Input:
9
10 22 9 33 21 50 41 60 80

Output:
6

7. Test Case 7:

Input:
5
3 10 2 1 20

Output:
3

8. Test Case 8:

Input:
4
3 2 6 4 5

Output:
4

9. Test Case 9:

Input:
6
3 10 2 1 20 4

Output:
4

10. Test Case 10:

Input:
5
1 3 6 7 9 4 10 5 6

Output:
6

Problem 9: Subarray Sum Equals K

Description:

Given an array of integers and an integer k, find the number of contiguous subarrays whose sum equals k.

Input Format:

1. An integer n representing the number of elements in the array.
2. An array of n integers.
3. An integer k representing the target sum.

Output Format:

1. Output the number of contiguous subarrays with sum equal to k.

Test Cases:

1. Test Case 1:

   Input:
   5
   1 1 1 1 1
   2

   Output:
   4

2. Test Case 2:

Input:
4
1 2 3 4
3

Output:
2

3. Test Case 3:

Input:
6
10 2 -2 -20 10 20
10

Output:
3

4. Test Case 4:

Input:
7
1 1 1 1 1 1 1
3

Output:
5

5. Test Case 5:

Input:
8
1 2 1 1 1 2 3 1
4

Output:
4

6. Test Case 6:

Input:
5
1 2 3 4 5
5

Output:
2

7. Test Case 7:

Input:
3
3 1 2
3

Output:
2

8. Test Case 8:

Input:
6
1 2 3 4 5 6
15

Output:
1

9. Test Case 9:

Input:
7
1 2 3 2 1 4 5
5

Output:
3

10. Test Case 10:

Input:
4
5 5 5 5
10

Output:
3

Problem 10: Find the Intersection of Two Arrays

Description:

Given two arrays, find their intersection. Each element in the result should be unique and appear in both arrays.

Input Format:

1. An integer m representing the number of elements in the first array.
2. An array of m integers.
3. An integer n representing the number of elements in the second array.
4. An array of n integers.

Output Format:

1. Output the intersection of the two arrays as a sorted list of unique elements.

Test Cases:

1. Test Case 1:

   Input:
   5
   1 2 2 1 3
   4
   2 3 3 4

   Output:
   2 3

2. Test Case 2:

Input:
4
4 5 9 10
6
4 4 5 6 7 10

Output:
4 5 10

3. Test Case 3:

Input:
6
1 2 2 1 3 4
5
2 2 3 4 5

Output:
2 3 4

4. Test Case 4:

Input:
3
7 8 9
3
9 8 7

Output:
7 8 9

5. Test Case 5:

Input:
5
1 2 3 4 5
5
2 4 6 8 10

Output:
2 4

6. Test Case 6:

Input:
4
5 6 7 8
5
6 7 8 9 10

Output:
6 7 8

7. Test Case 7:

Input:
7
1 2 3 4 5 6 7
4
4 5 6 7

Output:
4 5 6 7

8. Test Case 8:

Input:
5
10 20 30 40 50
3
30 40 50

Output:
30 40 50

9. Test Case 9:

Input:
6
11 12 13 14 15 16
4
12 13 16 17

Output:
12 13 16

10. Test Case 10:

Input:
8
3 5 6 8 9 10 15 20
7
5 8 9 11 15 20 25

Output:
5 8 9 15 20